New York State Department of Environmental Conservation
Division of Water, Region 7
615 Erie Boulevard West, Syracuse, New York 13204-2400
Phone: (315) 426-7500 • **Fax:** (315) 426-7459
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Joe Martens
Commissioner

July 10, 2013

Mr. Peter Grevelding, PE
O'Brien and Gere Engineers
333 Washington Street, PO Box 4873
Syracuse, NY 13221-4873

RE: Relinquishment of SPDES Permit
New Process Gear (NPG) SPDES No., NY 000-1384

Dear Mr. Grevelding:

The Department is in receipt of your July 3, 2013 letter regarding the relinquishment of NPG's SPDES permit. The Department is in agreement with the proposed sampling locations. However, your letter raised the question of why the Department was requiring NPG to sample the stormwater pond sediments for volatile organics and PCBs. As we discuss below, the Department believes that, under 6 NYCRR 750-2.11 that the pond sediments must be sampled for volatile organics and PCBs.

In 2002, the Department conducted a macroinvertebrate survey of Sanders Creek. The survey showed that PCBs, namely Aroclors 1254 and 1260 were present in crayfish taken from Sanders Creek approximately 50 m upstream of Kinne Street and even further upstream of Carrier Corporation's discharges. The levels were considered by the Department to be of concern. At the Department's request, during 2008 and 2009, NPG conducted a 6 month short term high intensity monitoring program for PCBs on the discharge from outfall 001. Aroclor 1260 was detected once, at 0.12 µg/l, in February 2009. July 10, 2009 correspondence from O'Brien and Gere Engineers indicated that NPG took three consecutive grab samples after this detection and had them analyzed using EPA Method 608 to ascertain whether or not PCBs were present. The sample results indicated that no PCBs were detected; leading O'Brien and Gere to conclude that there may have been a sampling or laboratory error on the first sample. Based on this, the Department is concerned that PCBs may in fact be present at the site. As PCBs tend to adhere to soil particles, the sediments in the pond may contain them. Also, EPA Mehtod 608 has a method detection limit of 0.068 µg/l, which is substantially above the water quality standard. Therefore, we request that the pond sediments be analyzed for PCBs prior to closure.

With respect to sampling for volatile organics, the Department notes that NPG has reported five spills since 2003. In at least two cases, the spill was contained in the stormwater pond. This

pond also receives stormwater runoff from the parking lot areas. The Department therefore believes that the pond sediments should be sampled for volatile organics.

Your letter also requested that the Department contact Summit Laboratory with respect to samples that were analyzed following the February 2013 spill of cutting oil to the pond. The sample results are being held by the laboratory until they receive payment for their analytical services. The Department's attorney will respond to this issue separately.

Please provide this office with your anticipated sampling schedule for the stormwater pond. Feel free to contact us should there be any question.

Sincerely,

Sandra Lizlovs, PE
Environmental Engineer II

cc: M. Benenati, NPG
D. Meixell, OBG
D. Bimber, NYSDEC
J. Sluzar, Esq. NYSDEC

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Joe Martens
Commissioner

March 24, 2014

Ms. Janet Haynes
Magna International
375 Magna Drive
Aurora, Ontario L4G7L6 Canada

RE: Relinquishment of SPDES Permit, SPDES No. NY 000-1384
New Process Gear (NPG) (T) DeWitt, Onondaga County New York

Dear Ms. Haynes:
The New York State Department of Environmental Conservation (Department) has reviewed O'Brien and Gere Engineers' November 12, 2013 submittal for the above-referenced site. The submittal was on behalf of Magna's former New Process Gear site in the Town of DeWitt. The submittal included sampling results of the sediment in the existing storm water pond at the former NPG site and was submitted as part of the Department's closure requirements for wastewater treatment facilities under 6 NYCRR 750-2.11. The submittal also included a map of the pond showing the approximate depth of sediment in the sampling locations. Your letter requested that, based on the data, that the Department discontinue the SPDES permit for NPG.

As discussed in our March 14, 2014 teleconference, the Department notes that several parameters exceed the 6 NYCRR Part 375 criteria for protection of groundwater. Based on the likelihood that this pond is not lined and that residual material in the pond may pose a threat to groundwater, it is necessary, prior to closure, to determine what additional actions are appropriate to protect the environment.

6 NYCRR 750-2.11(c)(2) requires proper management and/or removal of all residual materials. Within 30 days of this letter, please provide this office with your plan and proposed schedule to either remove the residual materials and/or properly manage them, which includes further evaluation of the threat to groundwater and sediment transport during wet weather. Please also include sampling data on any additional parameters such as Total Organic Carbon, that has not been previously submitted.

Feel free to contact this office should there be any questions or if you would like to discuss further this issue.

Sincerely,

Sandra Lizlovs, PE
Environmental Engineer II

cc: D. Meixell, O"Brien and Gere
K. Jaglal, O'Brien and Gere
M.J. Peachey, NYSDEC
J. Zalewski, NYSDEC
D. Bimber, NYSDEC
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J. Sluzar, Esq. NYSDEC

O'BRIEN & GERE

April 24, 2014

Ms. Sandra Lizlovs, PE
Environmental Engineer II
Division of Water, Region 7
New York State Department of Environmental Conservation
615 Erie Boulevard West
Syracuse, New York 13204-2400

RE: Relinquishment of SPDES Permit No. NY 000-1384
FILE: 3151/50538

Dear Sandy:

This letter, on behalf of New Process Gear, Inc. (NPG), is in response to your March 24, 2014 letter, regarding the on-going request from NPG to terminate SPDES Permit No. NY 000-1384. As you know, NPG was a tenant at the manufacturing facility located at 6600 New Venture Gear Drive in East Syracuse, New York that was subject to the SPDES permit. NPG did not own the facility and only operated there from 2004 to 2012, which is a fraction of the approximately 45-year life of the facility. The permit regulated discharges of facility stormwater (primarily from parking lots and the roof) with periodic inputs of water from boilers and cooling towers. The stormwater was collected in a pond and as solids settled out, discharged over a weir to a stormwater conveyance system. The source of water used in the boiler and cooling tower came from the on-site municipal water supply. Process wastewater generated at the facility was pretreated and discharged to the municipal sewerage system under an Industrial Wastewater Pre-treatment Permit.

On October 4, 2013, sediment in the pond was sampled and analyzed at the request of the Department in accordance with the approved August 14, 2013 Work Plan as part of the permit relinquishment. These data were provided to the New York State Department of Environmental Conservation (NYSDEC) by letter dated November 12, 2013. In your March 24, 2014 letter you raise the concern that the sediment in the pond "may pose a threat to groundwater" in contravention of 6 NYCRR Part 375. Notwithstanding that there could be some discussion as to the applicability of 6 NYCRR Part 375 to this situation, since NYSDEC referenced 6 NYCRR Part 375 in your March 24 correspondence, the data were evaluated using site-specific information in accordance with 6 NYCRR Part 375 and it was concluded that the residual material in the pond does not pose a threat to area groundwater and no further action is necessary. A discussion of the evaluation follows.

1. Potential Impacts to Groundwater

An initial comparison of the October 4, 2013 sediment data indicated that some of the parameters exceeded the default soil cleanup objectives (SCOs) for protection of groundwater included in 6 NYCRR Part 375-6 (see attached Table 1). However, the 6 NYCRR Part 375-6 SCOs were developed using default assumptions that according to 6 NYCRR Part 375-6.9 can be revised using site-specific data. Section 375-6.9 (e)(2) states that "for the calculation of a protection of groundwater or ecological resources contaminant-specific soil cleanup objective, the site-specific percentage of total organic carbon in the soil at the site may be substituted in the algorithms provided in Appendix E of the [Brownfield] Technical Support Document" (NYSDEC, December 2006). A total organic carbon (TOC) content of 1% was used in the development of the default SCOs. Site-specific TOC content of 10.7 % (North sample), 10.1 % (Middle sample) and 12.8 % (South sample), collected on October 4, were averaged (11.2 %) and used in the site-specific calculation.

The site-specific average TOC concentration was substituted in the algorithms provided in appendix E of the Brownfield Technical Support Document (NYSDEC, September 2006) to calculate site-specific SCOs for protection of groundwater for the parameters that exceeded the default concentrations provided in Table 375-6.8(b). The calculated site-specific SCOs are provided in Table 2. Table 3 provides a comparison of concentrations for the parameters that exceeded the protection of groundwater default SCOs contained in Table 375-6.8(b) with the calculated site-specific SCOs. Based on these revised site-specific SCOs, only three polycyclic aromatic hydrocarbons (PAHs) exceed the criteria at primarily the middle location, as indicated below (Table 4). The estimated (signified with a "J") value of 10 in the North sample exceeds the site-specific SCO by just 10 %.

TABLE 4. Magnitude of Exceedances of Site-specific Protection of Groundwater Soil Cleanup Objectives.

Parameter	North	Middle	Site-specific Protection of Groundwater SCO	Magnitude of site-specific SCO Exceedance
	mg/kg			
Benzo[a]anthracene		28.0 J	8.92	3.1 times
Benzo[b]fluoranthene		38.0 J	19.0	2.0 times
Chrysene	10.0 J	31.0 J	8.92	1.1 time (north) 3.5 times (middle)

The presence of PAHs in the sediment is consistent with pond use as a retention facility for stormwater from parking lots. Studies by Mahler and Van Metre (USGS, 201[illegible]) and the United States Environmental Protection Agency (USEPA)(Rowe and O'Connor, 2011) have identified coal-tar based pavement sealant (such as used in asphalt parking lots and flat industrial roofs) as a major source of PAHs (Van Metre et al., 2006) that enters the environment through many mechanisms including stormwater runoff. Stormwater from the parking lots also tend to collect atmospheric deposition of various chemicals including PAHs which are emitted into the atmosphere during combustion (USEPA, 2008; ATSDR, 1995). PAHs emitted to the air can be transported over long distances before they are deposited with atmospheric precipitation (Maliszewsks-Kordybach, 1999). As noted above, it is concluded that these PAHs are not posing a threat to area groundwater. This conclusion is based on the low magnitude of the exceedances and the conservative assumptions used in deriving protection of groundwater SCOs, as discussed below.

Low Magnitude of Exceedances. As noted on page 12 in the CP-51 Soil Cleanup Guidance (NYSDEC, 2010), "The exceedance of one or more applicable SCOs... alone does not trigger the need for remedial action, define 'unacceptable' levels of contaminants in soil, or indicates that a site qualifies for any [NYS]DEC remedial program..." "SCOs... are applicable statewide and do not account for many site-specific considerations which could potentially result in higher [cleanup] levels. Therefore, soil concentrations that are higher than the applicable SCOs... are not necessarily health or environmental concerns." " When an applicable SCO... is exceeded, the degree of public health or environmental concern depends on several factors, including the magnitude of the exceedance..."

These three PAHs are up to three and one-half times (i.e. up to a third of an order of magnitude) the site-specific SCOs indicating a relatively low magnitude of exceedances. The concentrations are all flagged with a "J" which indicates that the detected concentration is an estimated quantity which is less than the reporting limit but greater than or equal to the method detection limit. The reporting limits in this instance are also elevated as a result of the samples being diluted several times. The relatively minor exceedances are essentially localized to the middle sample which represents only one of the three pond locations sampled. The average impact of these PAHs in sediment at this location on the overlying water column across the whole pond is further diminished.

Criteria are Conservative. As noted in the Brownfield Technical Support Document (NYSDEC, September 2006), these criteria are cleanup objectives intended to result following the removal of source material. A source area typically includes a portion of a site where a substantial quantity of concentrated solid or semi-solid hazardous substances, non-aqueous phase liquids or grossly contaminated media are present (NYSDEC, December 2006). Protection of groundwater addresses the potential for residual soil contamination to leach and act as a long-term source of groundwater contamination (NYSDEC, September 2006). The protection of groundwater SCOs are derived based on soil-water partitioning theory. The Brownfield Technical Support Document (NYSDEC, September 2006) "...recognized that the organic soil-water partitioning theory itself is very conservative and probably overestimates the concentration of contaminants in the leachate generated from contaminated soil. Further this theory assumes a continuous flow of leachate and an infinite source of contamination, which is seldom the case" and is definitely not applicable to the pond in consideration. It also assumes equilibrium conditions are present. In this instance the presence of a concentration of Benzo(b)fluoranthene that is below the reporting limit is definitely not an infinite or even a significant source. Therefore, chemical concentrations just above the very conservative SCO would still be protective and not adversely impact the environment.

Another area in which the SCOs are conservative is in the selection of an appropriate organic-carbon partition coefficient (K_{oc}). There are a range of available K_{oc} values for the PAHs examined here, from laboratory measurements to estimates based on octanol-water partition coefficients and/or solubility. In calculating the site-specific SCOs the K_{oc} values used in developing the default 6 NYCRR Part 375 default SCOs were used. However, there are some significantly higher values in the literature and USEPA guidance. For example, there are available K_{oc} values (USEPA, 1996) up to two times (for Benzo[a]anthracene and Benzo[b]fluoranthene) the values that were used in the default SCO calculations. The use of lower K_{oc} values in the SCO derivations result in higher dissolved PAH concentrations in groundwater at equilibrium, and therefore conservatively lower SCOs.

In developing the protection of groundwater criteria tabulated in 6 NYCRR Part 375, a dilution factor of 100 was used based on assumed parameters for soil (e.g. porosity etc.), the presence of a vadose zone and a high soil to water ratio. However, this sediment is overlain by several feet of water (very low soil to water ratio) which would increase the dilution factor several times more. Considering that migration of any PAHs that desorb from the sediment would be by the very slow process of diffusion, a chemical concentration gradient would exist within the water column at the middle location (where the exceedances were noted) and progressively diminish at increasing distances away.

The pond has been in operation for approximately 45 years over which various natural attenuation processes would have taken place. Exceedances of only three PAHs from what is a family of compounds suggest that these concentrations represent residuals that are less prone to migration. This is supported by their low solubility, high hydrophobicity and high K_{oc} values. Organic chemicals sorbed to soil/sediment matrices tend to be less prone to release when present in the matrix over a long period or aged (Ghosh and Hawthorne, 2010). Also, "It has long been established that organic compounds are generally less soluble in aqueous solutions at colder temperatures than at warmer" (Hansen et al., 2003). Upstate New York experiences cold temperatures for almost a half of the year, thereby limiting the solubility of these chemicals over that time period relative to what would have been observed at room temperature in laboratory studies when determining K_{oc} values.

Black carbon consists of pure carbon in several linked forms that is formed through the incomplete combustion of fossil fuels, biofuel, and biomass, and is emitted in both anthropogenic and naturally occurring soot that travels over large distances in the atmosphere. Atmospheric deposition across the entire property can be transported in stormwater and concentrated in the pond via settling. It is likely that a portion of the carbon in the sediment is comprised of black carbon, which substantial research has shown, has a higher affinity for organic chemicals. The presence of black carbon has been observed to both slow and limit the degree to which PAHs partition out of contaminated soil and sediment (Qi et al., 2012; Yang et al., 2012). Thus equilibrium

concentrations in adjacent water is expected to be significantly less than would be estimated based on equilibrium partitioning using default K_{oc} values.

It is concluded herein that the residual material in the pond is not posing a threat to area groundwater and no further action is necessary. Only three PAHs at primarily one location (middle of the pond) exceed site-specific SCOs. The concentrations are low and are flagged as estimated because they are between the detection and reporting limits and elevated detection limits are due to several dilutions during analysis. The magnitudes of the exceedances are low at approximately one-third an order of magnitude. The facility has been in operation for several decades over which various natural attenuation processes would have taken place. The SCO development assumptions and process result in sufficiently conservative SCOs that the slight observed exceedances are still protective and do not pose a threat to groundwater. The presence of a portion of black carbon, a significant overlying water column, the low affinity for PAHs (especially aged in the soil or sediment) to solubilize and the colder area temperatures all contribute to a preponderance of factors that support this conclusion.

2. Sediment Transport During Wet Weather

In your March 24, 2014 letter, you mentioned sediment transport during wet weather. The primary function of the retention pond is to settle out and retain solids from stormwater. The presence of up to 14 inches of sediment in the pond is an indication that the pond is functioning effectively. This is achieved because the pond has a settling area of approximately 1 acre, an approximately 5-foot high weir at its outlet and structures at its incoming discharge which dissipate flow energy. Furthermore, sediment transport during wet weather had not been identified as an issue in the past and is not seen as an issue currently.

References

ASTDR (1995) Toxicological Profile for Polycyclic Aromatic Hydrocarbons. United States Department of Health and Human Services, Agency for Toxic Substances and Disease Registry.

Ghosh, U.; Hawthorne, S. B. (2010) Particle-scale Measurement of PAH Aqueous Equilibrium Partitioning in Impacted Sediments. *Environmental Science & Technology*, 44 (4), 1204-1210.

Hansen, D. J.; DiToro, D. M.; McGrath, J. A.; et al. (2003) Procedures for the Derivation of Equilibrium Partitioning Sediment Benchmarks (ESBs) for the Protection of Benthic Organisms: PAH Mixtures. United States Environmental Protection Agency, Office of Research and Development. EPA/600/R-02/013.

NYSDEC (2010) CP-51 / Soil Cleanup Guidance. Final Commissioner Policy, New York State Department of Environmental Conservation (NYSDEC).

NYSDEC (September 2006) New York State Brownfield Cleanup Program, Development of Soil Cleanup Objectives, Technical Support Document. New York State Department of Environmental Conservation (NYSDEC) and New York State Department of Health (NYSDOH).

NYSDEC (December 2006) 6 NYCRR Part 375 Environmental Remediation Programs, Subpart 375-6 (Environmental Restoration Program). New York State Department of Environmental Conservation (NYSDEC), Division of Environmental Remediation (DER).

Mahler, B. J.; Van Metre, P. C. (2011) Coal-Tar-Based Pavement Sealcoat, Polycyclic Aromatic Hydrocarbons (PAHs), and Environmental Health. United States Geological Survey (USGS) Fact Sheet 2011- 3010.

Maliszewsks-Kordybach, B. (1999) Sources, Concentrations, Fate and Effects of Polycyclic Aromatic Hydrocarbons (PAHs) in the Environment. Part A: PAHs in Air. *Polish Journal of Environmental Studies*, 8 (3), 131-136.

Qi, W.; Qu, J.; Liu, H.; Hu, C.; Lan, H.; Ren, H.; Xu, W. (2012) Partitioning and Sources of PAHs in Wastewater Receiving Streams of Tianjin, China. *Environmental Monitoring and Assessment,* 184 (4), 1847-1855.

Rowe, A. A; O'Connor, T. P. (2011) Assessment of Water Quality of Runoff from Sealed Asphalt Surfaces. United States Environmental Protection Agency (USEPA), Office of Research and Development, National Risk Management Research Laboratory – Water Supply and Water Resources Division. EPA/600/R-10/178.

USEPA (2008) Atmospheric Deposition of Toxic Substances to the Great Lakes: IADN Results through 2005. Environment Canada and the United States Environmental Protection Agency. EPA-905-R-08-001.

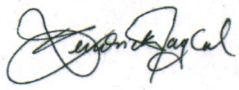
USEPA (1996) Soil screening Guidance: Technical Background Document. United states Environmental Protection Agency (USEPA). EPA/540/R-95/128.

Van Metre, P. C.; Mahler, B. J.; Scoggins, M.; Hamilton, P. A. (2006) Parking Lot Sealcoat: A Major Source of Polycyclic Aromatic Hydrocarbons (PAHs) in Urban and Suburban Environments. United States Department of the Interior and United States Geological Survey (USGS) in cooperation with the City of Austin, Texas. Fact Sheet 2005- 3147.

Yang, W.; Lampert, D.; Na, Z.; Reible, D.; Chen, W. (2012) Link between Black Carbon and Resistant Desorption of PAHs on Soil and Sediment. *Journal of Soils and Sediments*, 12, 713-723.

As always, we appreciate the Department's assistance in resolving these matters. We look forward to an expeditious relinquishment of the subject permit. Please contact me with any questions.

Very truly yours,
O'BRIEN & GERE ENGINEERS, INC.



Kendrick Jaglal, PE
Senior Technical Director

cc: Janet Haynes
Doreen Simmons, Esq.
David Meixell, PE

TABLE 1

Comparison of Site Data to (Default) Protection of Groundwater Soil Cleanup Objectives

Parameter	North	Middle	South	(Default) Protection of Groundwater SCOs
1,2-Dichlorobenzene	0.13	**1.3**	0.59	1.1
1,4-Dichlorobenzene	<0.09	0.18 J	<0.17	1.8
Chlorobenzene	0.032 J	**3.9**	1.0	1.1
Methyl acetate	<0.09	0.10 J	0.200	NA
Methylene chloride	**<0.09**	**0.110** JB	**0.081** JB	0.05
Acenaphthene	0.82 J	<47.0	<21	98
Anthracene	2.7 J	7.0 J	<21.0	1000
Benzo[a]anthracene	**8.8** J	**28.0** J	<21.0	1
Benzo[a]pyrene	8.9 J	**27.0** J	<21.0	22
Benzo[b]fluoranthene	**14.0** J	**38.0** J	<21.0	1.7
Benzo[k]fluoranthene	**7.5** J	**18.0** J	<21.0	1.7
Bis(2-ethylhexyl)phthalate	17.0	30.0 J	<21.0	435
Chrysene	**10.0** J	**31.0** J	<21.0	1
Dibenzofuran	0.36 J	<47.0	<21.0	NA
Fluoranthene	20.0	56.0	<21.0	1000
Indeno(1,2,3-cd)pyrene	4.8 J	<47.0	<21.0	8.2
Phenanthrene	7.3 J	25.0 J	<21.0	1000
Pyrene	19.0	48.0	<21.0	1000
PCB-1248	0.96	1.3	1.5	NA
PCB-1254	1.2	1.6	1.4	NA
PCB-1260	1.2	1.3	1.2	NA
Total PCBs	**3.3**	**4.2**	**4.1**	3.2
Arsenic	5.9	NS	NS	16
Barium	121 B	NS	NS	820
Cadmium	1.9	NS	NS	7.5
Chromium	27.6	NS	NS	NA
Lead	86.4	NS	NS	450
Selenium	1.4 J	NS	NS	4
Mercury	0.13	NS	NS	0.73
Total Organic Carbon	107,000	101,000	128,000	NA

NOTES:

NA: Not available

J: Result is an estimate below the reporting limit

B: Also found in blank

NS: Not sampled

Concentrations reported in units of mg/kg

Pond sediment samples collected on October 4, 2013

BOLD: Represents exceedances of (default) protection of groundwater soil cleanup objectives (SCOs) set forth in 6 NYCRR Part 375.

TABLE 2
Determination of Site-Specific Protection of Groundwater Soil Cleanup Objectives

Parameter	Class GA Groundwater Standard (µg/L)	Koc (L/kg)	Site-specific Protection of Groundwater SCO (mg/kg)
1,2-Dichlorobenzene	5	219	12.26
Chlorobenzene	5	219	12.26
Methylene chloride	5	11.7	0.66
Benzo[a]anthracene	0.002	398000	8.92
Benzo[a]pyrene	0.02	1020000	228.48
Benzo[b]fluoranthene	0.002	850000	19.04
Benzo[k]fluoranthene	0.002	850000	19.04
Chrysene	0.002	398000	8.92
Total PCBs	0.09	35555	35.84

NOTES: Site-specific Protection of Groundwater Soil Cleanup Objectives (SCOs) calculated in accordance with the 6 NYCRR Part 375 Technical Support Document using a site-specific total organic carbon value of 11.2 %. This is an average for samples North (10.7 %), Middle (10.1 %) and South (12.8 %).

Class GA groundwater standard for benzo[a]pyrene is not detected and the Method 8270C detection limit is 0.2 µg/L. However, a conservative value of 0.02 µg/L was used to be consistent with the default calculations in 6 NYCRR Part 375 and USEPA's maximum contaminant level.

TABLE 3
Comparison of Site Data Exceeding Default Protection of Groundwater Soil Cleanup Objectives (SCOs) to Site-specific SCOs

Parameter	North	Middle	Site-specific Protection of Groundwater SCO
	mg/kg		
1,2-Dichlorobenzene	--	1.3	12.3
Chlorobenzene	--	3.9	12.3
Methylene chloride	<0.09	0.11 JB	0.66
Benzo[a]anthracene	8.8 J	**28** J	8.92
Benzo[a]pyrene	--	27 J	228
Benzo[b]fluoranthene	14 J	**38** J	19.0
Benzo[k]fluoranthene	7.5 J	18 J	19.0
Chrysene	**10** J	**31** J	8.92
Total PCBs	3.3	4.2	35.8

NOTE: Exceedances of site-specific Protection of Groundwater SCOs are highlighted in **bold**.